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10/023,137	12/17/2001	Nathan D. Cahill	83512THC	4712

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EXAMINER	
YODER III, CHRISS S	
ART UNIT	**PAPER NUMBER**
2622	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/023,137	CAHILL ET AL.	
	Examiner	Art Unit	
	CHRISS S. YODER III	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-13,15,17-22 and 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *18 and 21* is/are allowed.

6)☒ Claim(s) *1-4,6-13,15,17,19,20,22 and 25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed January 11, 2008 have been fully considered but they are not persuasive.

Applicant argues, with respect to claims 1, 19 and 25, that Szeliski et al. is not understood to teach or suggest the use of an error measure that includes the use of two radial functions. However, the Examiner notes that Szeliski discloses the use of an error measure for calculating the focal length in column 20, line 41 – column 25, line 34. Additionally, equation (33) shows the use of ray directions p_j and p_{jk}, which are considered to be radial functions corresponding to two different images, in order to optimize the error in calculating the focal length. Therefore, Szeliski is considered to disclose determining a focal length used in a capture of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions, wherein said determining step comprises optimizing an error measure that includes two radial functions, each of the two radial functions corresponding to a different source digital image, and wherein the error measure is a function of the one or more sets of corresponding pixel values (column 15, line 65 - column 16, line 62 and column 20, line 41 – column 25, line 34, and figure 1:110; an initial estimate of the focal length is calculated, then these values are optimized using an error measure that is a function of the images; equation (33) shows the use of ray directions p_j and p_{jk}, which are considered to be radial functions corresponding to two different images, in order to optimize the error in calculating the focal length).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 11 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 11 and 12 depend from cancelled claim 23. Therefore, the Examiner believes that claims 11 and 12 should be cancelled as well.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. **Claims 1-3, 6, 7, 13, 15, 17, 19-20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440).**

2. In regard to **claim 1**, note Szeliski discloses the use of a method for producing a composite digital image, comprising the steps of providing a plurality of partially overlapping source digital images having pixel values that are linearly or logarithmically related to scene intensity, wherein the source images have overlap regions wherein

pixels of the images correspond in scene content and differing in scene content outside said overlap regions (figure 1: I_0-I_k), determining a focal length used in a capture of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions, wherein said determining step comprises optimizing an error measure that includes two radial functions, each of the two radial functions corresponding to a different source digital image, and wherein the error measure is a function of the one or more sets of corresponding pixel values (column 15, line 65 - column 16, line 62 and column 20, line 41 – column 25, line 34, and figure 1:110; an initial estimate of the focal length is calculated, then these values are optimized using an error measure that is a function of the images; equation (33) shows the use of ray directions p_j and p_{jk}, which are considered to be radial functions corresponding to two different images, in order to optimize the error in calculating the focal length), and combining adjusted source digital images to form a composite digital image by blending said overlap regions (column 30, lines 20-30; the two images are blended to create a mosaic image after other processing/adjustments have been performed).

Therefore, it can be seen that the Szeliski device fails to disclose that the adjustments that are performed on the images include computing from the determined focal length, a radial exposure transform to compensate for exposure fall off as a function of the distance of a pixel from the center of the digital image and modifying the source digital images by applying a radial exposure transform to one or more of the source digital images to produce adjusted source digital images.

Toyoda discloses the use of the focal length to determine the radial transform for the correction of exposure falloff (column 1, lines 49-52, the marginal attenuation is considered exposure falloff; column 10, line 17-column 11, line 55; the focal length is used to compensate for marginal attenuation in the image). Toyoda teaches that the use of the focal length to determine the radial transform for the correction of exposure falloff is preferred in order to eliminate the need for a lens system having a complicated arrangement that is typically needed to correct for exposure falloff (column 1, lines 62-67). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to use focal length determined by Szeliski to determine the radial transform for correction of exposure falloff, as suggested by Toyoda, in order to edit the image without the use of heavy / large lens systems.

3. In regard to **claim 2**, note Szeliski discloses the a step of applying a linear exposure transform to one or more of the source digital images prior to combining the adjusted source digital images to produce adjusted source digital images having pixel values that closely match in an overlapping region (column 30, lines 20-30; the two images are blended to create a mosaic image).

4. In regard to **claim 3**, note Toyoda discloses that the radial exposure transform includes a $\cos^4$ dependence on the distance from the center of the image (column 1, lines 46-52; the vignetting is influenced by the $\cos^4$ law of illumination).

5. In regard to **claim 6**, note Szeliski discloses that the combining step includes calculating an average of the pixel values in the overlapping region (column 30, lines 20-30).

6. In regard to **claim 7**, note Szeliski discloses transforming the pixel values of the composite digital image to output device compatible color space (column 9, lines 31-35).

7. In regard to **claim 13**, note Toyoda discloses the storage of the transform information (column 9, lines 45-48). Therefore, it can be seen that the primary reference of Szeliski in view of Toyoda fails to disclose the use of metadata stored with the image to store the radial transform. Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of metadata to store the radial transform in order to store the associated data together for better organization as well as to keep related data together in instances such as data transfer from one device to another.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of storing additional image parameters and camera settings as metadata, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

8. In regard to **claim 15**, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 1. Therefore, it can be seen that the primary reference fails to disclose that the radial exposure transform is calculated using a flash indicator. Official notice is taken that the concepts and advantages of using a flash indicator to calculate the radial

exposure transform are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a flash indicator to calculate the radial transform in order to compensate for flash falloff.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of a flash indicator to calculate the radial transform in order to compensate for flash falloff, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

9. In regard to **claim 17**, note Szeliski discloses the use of a computer program product comprising computer readable storage medium having a computer program stored thereon for performing the method of claim 1 (column 7, lines 46-51).

10. In regard to **claim 19-20**, these are apparatus claims, corresponding to the method of claims 1-2. Therefore, claims 19-20 have been analyzed and rejected as previously discussed with respect claims 1-2.

11. In regard to **claim 22**, note Toyoda discloses that the determining step further comprises analyzing the exposure falloff in at least one of said overlap regions (column 10, line 17-column 11, line 55; the focal length is used to analyze the image for marginal attenuation in order to compensate the image and reduce the effects of falloff).

12. Claims 4 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al.

(US Patent # 5,461,440) and "Reference Input/Output Medium Metric RGB Color Encodings".

13. In regard to **claim 4**, note Szeliski discloses that the step of providing source digital images comprises capturing images and storing them in a digital memory (column 9, lines 13-18). Therefore, it can be seen that the primary reference of Szeliski in view of Toyoda fails to disclose that the transform is a metric transform that is scene independent.

"Reference Input/Output Medium Metric RGB Color Encodings" discloses the use of a metric transform that is applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent (found in the abstract, RIMM/ROMM is an metric encoding technique used to transform the source images; and in the first two paragraphs of the Introduction it can be seen that the image can be device dependent instead of scene dependent). "Reference Input/Output Medium Metric RGB Color Encodings" teaches that the use of a metric transform applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent is preferred in order to increase the dynamic range of the stored image in order to match a device (page 7: ERIMM RGB Color Encoding). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a metric transform that is applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity

that is scene independent in order to increase the dynamic range of the stored image as suggested by "Reference Input/Output Medium Metric RGB Color Encodings".

14. In regard to **claim 8**, note "Reference Input/Output Medium Metric RGB Color Encodings" discloses that the metric transform includes a color transformation matrix (page 4: ROMM RGB Conversion Matrix- the transform uses a color transformation matrix).

15. In regard to **claim 9**, note "Reference Input/Output Medium Metric RGB Color Encodings" discloses that the metric transform includes a lookup table (page 2:Selection of Color Space- paragraph 2, "simple LUT-matrix-LUT transformation can be used").

16. In regard to **claim 10**, note Szeliski in view of Toyoda and "Reference Input/Output Medium Metric RGB Color Encodings" discloses the use of a method for producing a composite digital image as claimed in claim 4. Therefore, it can be seen that the primary reference fails to disclose that the metric transform is included as metadata with the corresponding source digital image. Official notice is taken that the concepts and advantages of storing information pertaining to the image as metadata is notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the storage of the metric transform as metadata in order to store the associated data together for better organization as well as to keep related data together in instances such as data transfer from one device to another.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of storing additional information pertaining to the image as metadata, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

17. **Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854).**

18. In regard to **claim 25**, note Szeliski discloses the use of a method for determining a focal length used in a capture of a plurality of partially overlapping source digital images, the method comprising the steps of providing the plurality of partially overlapping source digital images, said source digital images having overlap regions wherein pixels of said source digital images correspond in scene content, said source digital images differing in scene content outside said overlap regions (figure 1: I_0-I_k), and determining the focal length used in the capture of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions, wherein said determining step comprises optimizing an error measure that includes two radial functions, each of the two radial functions corresponding to a different source digital image, and wherein the error measure is a function of the one or more sets of corresponding pixel values (column 15, line 65 - column 16, line 62 and column 20, line 41 – column 25, line 34, and figure 1:110; an initial estimate of the focal length is calculated, then these values are optimized using an error measure that is a function of the images; equation (33) shows the use of ray directions p_j and p_{jk}, which

are considered to be radial functions corresponding to two different images, in order to optimize the error in calculating the focal length). Therefore, it can be seen that the Szeliski device fails to explicitly disclose storing the focal length in a computer readable storage medium.

Official Notice is taken that the concepts and advantages of storing calculated values are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the Szeliski device to store the focal length in order to allow the source images to be combined at a later time (e.g. after all of the source images to be combined are captured/input and the focal lengths of all of the images are calculated).

Allowable Subject Matter

Claims 18 and 21 are allowed.

19. As for claims 18, the prior art does not teach or fairly suggest the use of a method for producing a composite digital image using the root of the function:

$$g(f) = I_i'' \cos^4\left(\tan^{-1}\left(f^{-1}\sqrt{u_i^2 + v_i^2}\right)\right) - I_i' \cos^4\left(\tan^{-1}\left(f^{-1}\sqrt{x_i^2 + y_i^2}\right)\right)$$

to calculate the focal length of the overlapping regions.

20. As for claims 21, the prior art does not teach or fairly suggest the use of a system for producing a composite digital image using the root of the function:

$$g(f) = I_i'' \cos^4\left(\tan^{-1}\left(f^{-1}\sqrt{u_i^2 + v_i^2}\right)\right) - I_i' \cos^4\left(\tan^{-1}\left(f^{-1}\sqrt{x_i^2 + y_i^2}\right)\right)$$

to calculate the focal length of the overlapping regions.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRISS S. YODER III whose telephone number is (571)272-7323. The examiner can normally be reached on M-F: 8 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lin Ye can be reached on (571) 272-7372. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

C. S. Y.
Examiner, Art Unit 2622

/Tuan V Ho/
Primary Examiner, Art Unit 2622